Time-varying spectral analysis on Hilbert spaces

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TIME–VARYING SPECTRAL ANALYSIS ON HILBERT SPACES: THEORY AND PRACTICE

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1. While the assumption of weak stationarity leads to great simplification of the analysis of stochastic processes and therefore forms the basis of most statistical inference procedure, it is often not justified in practice. (Chapter 1,2,3 and 4)

2. Taking into account the violation of weak stationarity is essential for correct inferences. This holds both for stochastic processes of which the elements take values in Euclidean spaces as well as for stochastic processes of which the elements belong to infinite–dimensional Hilbert spaces. (Chapter 1,3 and 4)

3. Functional processes with time–varying characteristics require a different analysis and a different asymptotic framework than those for which these are generated by time–invariant mechanisms. (Chapter 1 and 3)

4. In the empirical determination of time–varying spectra one cannot obtain an arbitrary high degree of resolution in both the time and the frequency domain. To obtain the 'optimal' degree in each direction a data–driven approach might be preferred over the use of asymptotic results. (Chapter 2)

5. Testing the validity of weak stationarity for functional time series is essential to prevent model misspecification and henceforth the drawing of incorrect inferences. A frequency domain approach is desirable when the source of nonstationarity is unknown and not necessarily abrupt. (Chapter 4)

6. Theoretical research should be justified and should be relevant. Relevance is however not the same as direct applicability. A thorough understanding takes time to develop and its translation to applications might only become clear when sufficient progress is made in this understanding.

7. Infinity may be an abstract concept but the finiteness of many things is often much more difficult to deal with. Both science and religion provide evidence to this claim.

8. While reflecting, John W. Tukey once said 25 years ago : "My feeling [...] is that our current frequency/time techniques are quite well developed [...], so that the most difficult questions are not how to solve it but rather either how to formulate it, or how do we extend applicability to less comfortable conditions." Less comfortable exactly applies to nonstationary (functional) time series, many would think.

9. By hiring the 'bike guards', Maastricht university is endangering the fundamental right of Dutch citizens to park their bikes measure–theoretic appropriately. Namely, almost everywhere.

10. A physicist, a mathematician and a statistician go duck hunting. Assuming they all enjoy this activity and none of them is an animal activist, this activity will always have most value to the statistician.